



Northern Rhodesia

Department of Agriculture

ANNUAL REPORT

for the Year

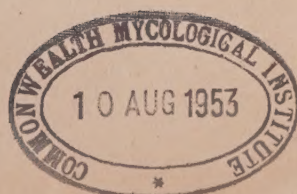
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CONTENTS

Para.

Staff List.

PART I.—AGRICULTURE IN THE TERRITORY.

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PART II.—THE WORK OF THE DEPARTMENT.

[illegible]

APPENDIX.

Conservation Services.

STAFF LIST AT 31st DECEMBER, 1952

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H. de B. Barwis, Clerk (Accounts).
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Miss M. F. Dauncey, Stenographer.
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G. M. Gunn, Mechanical Superintendent, Lusaka.
J. Wells, Mechanical Supervisor, Lusaka.
E. J. Beckford, Mechanical Supervisor, Broken Hill.
E. C. Ward-Watson, Mechanical Supervisor, Lusaka.
J. Mumberson, Mechanical Supervisor, Broken Hill.
C. A. Holberry, Mechanical Supervisor, Lusaka.
R. S. Bird, Mechanical Supervisor, Mazabuka.
S. W. Hazlewood, Mechanical Supervisor, Lusaka.
T. Bell, Workshop Mechanic, Lusaka.
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BAROTSE PROVINCE.

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African Agricultural Assistants, 13.
African Agricultural Capitaos, 14

WESTERN PROVINCE.

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P. A. Henderson, Agricultural Supervisor, Kambowa.
J. H. S. Perioli, Agricultural Supervisor, Fort Rosebery.
J. G. C. King, Agricultural Supervisor, Kabompo.
G. W. E. Pickworth, N.D.A., O.D.A., Agricultural Supervisor, Kambowa.
African Agricultural Assistants, 25.
African Agricultural Capitaos, 55.

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A. J. Carver, Agricultural Supervisor, Chalimbana Government Farm.
W. V. Morony, Agricultural Supervisor, Mumbwa.
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R. H. Howard, M.B.E., Senior Agricultural Supervisor, Sala.
A. D. McLeod, Agricultural Supervisor, Serenje.
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African Agricultural Assistants, 10.
African Agricultural Capitaos, 18.

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O. J. Gray, Agricultural Supervisor, Monze.
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J. M. Frew, Agricultural Supervisor, Mapangazia.
P. W. Lake, Agricultural Supervisor, Gwembe.
African Agricultural Assistants, 33
African Agricultural Capitaos, 23.

EASTERN PROVINCE.

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Mrs. E. Gabriel, Agricultural Supervisor, Kalichero.
W. A. Denchfield, Agricultural Supervisor, Chadiza.
P. J. Fisher, Agricultural Supervisor, Katete.
L. N. Raynor, Agricultural Supervisor, Katete Agricultural Training School, Katete.
A. S. Heaton-Smith, N.D.A., C.D.A., Agricultural Supervisor, Lundazi.
African Agricultural Assistants, 33.
African Agricultural Capitaos, 102.

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E. G. Dabinett, Agricultural Supervisor, Isoka.
African Agricultural Assistants, 25.
African Agricultural Capitaos, 37.

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J. H. Rhodes, B.SC., DIP. AGRIC. (CANTAB.), D.T.A., Agricultural Officer.
A. T. Wilson, B.SC., DIP. AGRIC. (CANTAB.), D.T.A., Agricultural Officer.
A. N. Beaumont, B.SC., Conservation Officer.
P. E. Maitin, B.SC., Conservation Officer (pending resignation).
J. R. Duckworth, Agricultural Supervisor.
I. L. Edwards, Agricultural Supervisor.
P. F. Freeman, N.D.A., C.D.A., Agricultural Supervisor (pending resignation).
D. F. Wallace, Agricultural Supervisor.
J. Meade, Clerk.
Miss G. M. N. Briggs, Stenographer.

Department of Agriculture

ANNUAL REPORT FOR THE YEAR 1952

PART I.—AGRICULTURE IN THE TERRITORY.

INTRODUCTION.

Adverse weather conditions, together with mounting costs and increasing labour problems, combined to make the 1951-1952 season one of the most difficult on record for the arable farmer. Following a promising start, abnormally heavy rains were experienced in December, January and February, which ceased abruptly at the beginning of March. Lack of sunshine in the growing season was probably the most significant factor affecting crops. By contrast, grassland flourished and livestock came through the season well, emphasising the importance of balanced farming systems combining livestock with crops husbandry. On the credit side also must be mentioned the replenishment of underground water supplies depleted by past drought years.

2. On all but the best farmed lands, maize yields were poor, necessitating the importation of over a third of the Territory's annual requirements for urban consumption. This situation contrasts markedly with the fear of over-production expressed two years ago. The erection of silo storage in Lusaka by the Maize Control Board was completed during the year with a capacity of 150,000 bags. This will be of importance in evening-out supplies in circumstances of varying production; plans for two more similar installations on the line of rail are being prepared.

3. The output from African farms this season was especially low. Food supplies were adequate in most areas but the surplus for sale was much reduced; such shortages as did occur were more frequently due to over-selling than to under-production. The bulk of the time of the department in African areas is spent in dealing with the problems which arise in development away from a subsistence level of production. Peasant farming groups, particularly in the Eastern Province, have made good progress and indicate that this scheme provides a satisfactory way of introducing capital under control. In the Southern and Central Provinces, improved farmers' crops were outstanding by comparison with the bulk of surrounding farms, giving a clear measure of the task before us. Land use problems in the Southern Province have received attention. The African attitude to stock keeping must somehow be changed to animal husbandry, which in its turn must be integrated with crop production if the soil is to be saved. Only the African himself can apply the solution, albeit with our guidance. At present he shows distressingly little awareness of the essentials of the problems, which in these days he tends to regard as political and social in nature rather than agricultural and economic, and agricultural extension work in African areas in all provinces has been affected by political interference.

4. The tobacco crop suffered both in quantity and quality. Average prices received for the western crop in Salisbury recovered after a poor start, but the market in Fort Jameson for the eastern flue-cured crop collapsed and much tobacco, especially in the middle grades, was sold below cost of production. Considerable Government assistance had to be given in the eastern area and special flood relief loans, totalling £169,610, were made available in both the eastern and western areas to enable 132 farmers who might otherwise be forced off the land to plant a crop for the 1952-1953 season. About a quarter of the planters in the Eastern Province left their farms.

5. A season such as this tests particularly the new settler who is struggling to open up new lands, to plant a crop, and to erect buildings. Few enter with adequate capital and development depends upon current returns. Farmers in the newly-opened Mkushi Block have demonstrated that flue-cured tobacco of high quality can be produced there and the prospects for cattle ranching appear good, but for the present the area must still be regarded as unproven. With the rapid development taking place in the Territory in all directions, there is an increasing demand for foodstuffs in ever-greater quantity and variety which can be met only by more stable and more intensive methods of production. We are passing out of the pioneering phase and capital is needed to assist development. Consideration was being given at the close of year to the introduction of a European tenant-farming scheme on an assisted ownership basis on the lines of similar schemes successfully introduced in Kenya.

6. The Natural Resources Board has given consideration to the need for regional planning including major water control works, regional fire breaks, water conservation for irrigation, and to farm planning within the major schemes. Intensive conservation committees have settled down with considerable enthusiasm and show in the more advanced areas encouraging signs of a self-help approach and a growing appreciation of true conservation principles through vegetational control.

7. The annual show of the Northern Rhodesia Agricultural Society was held in Lusaka on 14th and 15th July and proved a great success. Weather conditions were ideal, exhibits in all classes were good and attendance broke all records. The machinery and implements displayed were particularly impressive and alluring, making many farmers wish the season had been more successful.

8. The third annual congress of the Northern Rhodesia Farmers' Union was held in Lusaka on 21st and 22nd August with the President, Mr. William Wroth, O.B.E., in the Chair. The theme of the congress was "Food Production" and, as in previous years, the level of debate was of a high order.

Maize.

9. The area planted to maize on European farms in 1951-52 was approximately the same as in the previous year, that is around 98,000 acres, but the overall yield was much below estimate.

Farmers who maintained their soil in good physical condition by regular green cropping and followed sound fertiliser programmes, reaped good crops in spite of the adverse season, but the general average was low. The value of early planting was marked and the advantage lay with those farmers having sufficient equipment to make full use of the first rains.

MAIZE PRODUCTION ON EUROPEAN FARMS.

<i>Season</i>	<i>Acreage planted</i>	<i>Estimated total crop reaped (200 lb. bags)</i>	<i>Estimated bags per acre reaped</i>
1947-48	65,800	435,000	6.6
1948-49	74,040	370,500	5.0
1949-50	105,000	572,000	5.4
1950-51	98,265	467,000	4.7
1951-52	98,000	433,500	4.4

10. The African farmer is at a special disadvantage in a difficult season with his slow rate of land preparation and protracted planting season; the contribution of the surplus African production to the territorial food supply was again low as shown by the following table:

MAIZE PRODUCTION FOR SALE IN THE RAILWAY BELT.

(Thousands of bags of 200 lb.)

<i>Year</i>	<i>European grown</i>	<i>African grown</i>	<i>Total</i>
1944	212	115	327
1945	273	202	475
1946	268	172	440
1947	190	54	244
1948	343	296	639
1949	283	61	344
1950	447	344	791
1951	399	290	689
1952	389	173	562

11. Maize consumption in the Territory continues to rise at an alarming rate: the estimated requirements of the Maize Control Board for the 1952-53 consumption year total over a million bags. Arrangements have been made for 404,975 bags of maize to be imported from Nyasaland, Southern Rhodesia and Portuguese East Africa and 15,000 bags of cassava meal from the Belgian Congo.

12. The Eastern Province produced a useful surplus of 70,000 bags, African grown, which was purchased by the Maize Control Board. The road haul of approximately 400 miles to the line of rail makes Eastern Province production for export uneconomic in normal years.

MAIZE MARKETING IN THE EASTERN PROVINCE.

(Bags of 200 lb.).

<i>Year</i>	<i>Local production</i>	<i>Imports</i>	<i>Total</i>
1949	30,500	22,500	53,000
1950	48,000	12,000	60,000
1951	80,000	Nil	80,000
1952	101,000	Nil	101,000

The marketing of maize in the Eastern Province has been put on a sound basis by the development of an Eastern Province Produce Pool which will come into operation in 1953. The price paid to the producer for maize during the year was 16s. 6d. per bag of 200 lb. net and 2s. 6d. per bag was paid into a betterment fund.

13. On the grounds of reduced yields due to the adverse season, the controlled price of maize delivered at line of rail depots, which is based on a cost of production formula, was raised in March from 37s. 0d. to 39s. 0d. per bag following strong representations from the Farmers' Union to Government. The cash payment to African farmers at rural depots in the Maize Control Board area was also increased by 2s. 0d. to 27s. 3d. per bag: the difference between the cash payment to the African producer and the price paid by the board is used to defray rural buying expenses, and the balance is credited to the African Farming Improvement Fund.

14. There is little doubt that the Territory's future food supply must depend upon more consistent yields per acre from higher farming standards. The price formula for maize is based upon an assumed average yield of nine bags per acre and allows for an area green cropped annually equivalent to the maize acreage. Statistical returns show, however, that green cropping is practised upon little more than one-third of the maize acreage. It may well be that research will enable grass leys to supersede the practice of green cropping with greater economy and benefit to the livestock industry.

Wheat.

15. Wheat production, which is dependent upon winter irrigation, has remained depressed for a number of reasons, notably a succession of dry years until the present, a price considered unattractive

under conditions of labour shortage, the severe depredations by birds on scattered crops, particularly finches (*Quelea* spp.), and the incidence of rust. The trend of production is shown by the following table:

WHEAT PRODUCTION FOR SALE.						
(Tons of 2,000 lb.).						
1945	...	...	...	...	...	2,550
1946	...	...	...	...	...	2,475
1947	...	...	...	...	...	500
1948	...	...	...	...	...	900
1949	...	...	...	...	...	150
1950	...	...	...	...	...	325
1951	...	...	...	...	...	84
1952	...	...	...	...	...	113

Due to the growth of the European population and the developing tastes of the urban African, wheat consumption is rapidly increasing in the Territory, —18,000 tons were imported in 1951 as compared with 13,000 tons the previous year. The controlled price to producers has been raised from 56s. 0d. per bag of 200 lb. to 70s. 0d.; it is hoped that this increase, combined with improved water conditions resulting from this year's rains, will result in renewed interest in the crop. Trials are being undertaken with summer wheat from Kenya, but the rust factor is at present unknown.

Tobacco.

16. The flue-cured tobacco industry reached a peak of expansion as regards the number of growers; 209 registered growers in the eastern area sold 4,104,660 lb. of cured tobacco over the Fort Jameson auction floors for an average price of 20.71d. per lb.; in the western area 325 registered growers produced 5,418,723 lb. which sold on the auction floors in Salisbury for an average price of 32.25d. per lb. The very wet season reduced both yield and quality. The high proportion of low quality leaf, and a change from a "seller's" to a "buyer's" market resulted in reduced prices.

17. In the Eastern Province the market was dead and prices disastrously low for all but the highest quality. Many growers were left with inadequate resources to enable them to carry on. Government, through the North-Eastern Rhodesia Agricultural Association, gave financial relief by providing short-term loans and made available funds to the extent of £30,000 to enable the Association to buy in bales fetching what were considered to be prices below market value in the third sequence. A total of 630 bales were bought-in for direct shipment to London. The following table shows the trend of prices in comparison with those obtained in 1951:

FORT JAMESON SALES.			
		1951	1952
1st Sale, S.A. quota	...	372,303 lb. at 83.396d. per lb.	320,053 lb. at 45.498d. per lb.
1st Sale, non-quota	...	862,220 lb. at 49.918d. per lb.	801,279 lb. at 22.299d. per lb.
2nd Sale, non-quota	...	1,365,042 lb. at 38.481d. per lb.	1,503,450 lb. at 20.348d. per lb.
3rd Sale, non-quota	...	1,211,877 lb. at 22.984d. per lb.	1,479,887 lb. at 14.868d. per lb.
4th Sale, non-quota	...	602,452 lb. at 15.062d. per lb.	—
Total	...	4,041,591 lb. at 32.783d. per lb.	4,104,669 lb. at 20.714d. per lb.

It has been decided to close the Fort Jameson auction floors for a trial period of two years and arrangements have been made to sell in Salisbury.

18. The number of registered growers of flue-cured tobacco for the 1952–53 season in the eastern and western areas, has dropped by a quarter, i.e. from 534 to 406 and there appears to be a genuine desire on the part of growers to pay more attention to detail to ensure quality for which there is an assured market. The following extract from page 25 of the annual report for 1926 is still as true to-day:

"The aim of the planters of Northern Rhodesia must be quality and not quantity, and the planters should be limited to an acreage over which careful supervision can be exercised."

19. The production of Burley tobacco in the Eastern Province has further declined to 124,180 lb. in 1952, which received an average price of 28.22d. per lb. on the Fort Jameson floors. The number of African growers has fallen from 2,530 in 1950–51 to 1,437 in 1951–52, due to the greater attraction of groundnuts and maize as less exacting cash crops and to disappointment in cash returns after meeting the overhead expenses of the Petauke Co-operative Marketing Union spread over smaller crops. Every endeavour will be made to revive interest to its former level, but the signs are not encouraging. In the coming season, with the closing of the Fort Jameson floors, the crop will be marketed at Limbe, Nyasaland.

20. The Turkish tobacco industry remained at a low level of production of around 50,000 lb. grown entirely in the western area. It is unfortunate that this valuable dollar-earner has declined, due largely to unsuitable seasons and the profitability of flue-cured Virginia tobacco.

21. The production of sun and air cured tobacco amounted to only some 28,000 lb. produced in the Eastern Province.

Tobacco Mission to Europe.

22. A goodwill delegation consisting of the Chief Tobacco Adviser, Mr. J. C. Collins, Mr. R. W. Dean, representing the North-Western Rhodesia Tobacco Association, and Mr. M. S. Visagie, representing the North-Eastern Rhodesia Agricultural Association, visited Europe during the year to investigate markets for Northern Rhodesian tobacco. The United Kingdom, Denmark, Norway, Sweden, France and Germany were visited and Israel on the return journey. Valuable contacts were made and the mission accomplished all that was expected of it.

23. The general trend of development in the industry is shown by the following table:

TOBACCO PRODUCTION.
(in lb. weight.)

Season	Flue-cured Virginia		Total	Other Virginia (a)	Burley (a)	Turkish		Total all Types
	E.A.	W.A.				E.A.	W.A.	
1943-44 ...	2,058,000	240,000	2,298,000	*	54,000	*	80,000	2,432,000†
1944-45 ...	2,207,000	243,000	2,450,000	31,000	85,000	20,000	403,000	2,989,000
1945-46 ...	2,823,000	307,000	3,130,000	43,000	77,000	28,000	1,000,000	4,378,000
1946-47 ...	2,928,600	500,000	3,428,600	83,000	125,000	26,500	1,000,000	4,662,100
1947-48 ...	2,988,000	781,500	3,769,500	*	140,000	—	585,590	4,495,090†
1948-49 ...	4,076,300	1,691,600	5,767,900	*	178,800	—	97,000	6,043,700†
1949-50 ...	3,214,500	2,956,500	6,171,000	42,500	327,100	—	115,330	6,655,930
1950-51 ...	4,413,894	6,262,457	10,676,351	50,000	252,879	—	49,368	11,028,598
1951-52 ...	4,104,669	5,418,723	9,523,392	25,000	124,180	—	50,000	9,722,572

NOTE.—(a)=Production confined to Eastern Area.

E.A.=Eastern Area.

W.A.=Western Area.

*=Not obtainable.

†=Incomplete.

Beans and Cowpeas.

24. Pulse crops suffered considerably from excessive rain followed by the early and sudden onset of the dry season. From all parts of the country low yields are reported and relatively small quantities surplus to food requirements have been offered for sale. The co-operative societies in the Eastern Province handled some 420 bags of beans and 1,080 bags of cowpeas mostly from Lundazi and Petauke. A little over 1,000 bags of beans and cowpeas were purchased by merchants in the Northern Province. More attention must be paid to pulse crops in the future. A large demand exists particularly for beans of the Phaseolus type.

Groundnuts.

25. The season was not favourable for groundnuts, the incidence of rosette disease and leaf spot was high and yields were disappointing. Greater interest is being shown in this crop particularly in the Eastern Province where 4,250 bags were marketed through official marketing organisations. The line of rail price was increased during the year from £45 to £50 per ton for decorticated nuts and this appears to be having the desired result. Production at around 500 tons per annum is far below the market requirements of this important crop.

Rice.

26. The rice industry, though still on a very small scale, has continued to expand steadily particularly in Barotseland and the Fort Jameson District of the Eastern Province. It is entirely a peasant-produced crop. In Barotseland 1,756 bags of paddy (160 lb.) were marketed, and 3,790 bags of paddy and 410 bags (200 lb.) of native hulled rice in the Eastern Province. The Northern Province exported 525 bags of rice to the line of rail from the Abercorn District. Rice is regarded primarily as a cash crop although its consumption is slowly increasing in Barotseland. Total production is at present too small, quality is too low and the price too high, for rice to be acceptable as a food staple by the mines, although they have provided a valuable guaranteed market for 350 tons at 8d. per lb. to assist the industry. It is very desirable that this young industry should be carried through its development phases; rice is a high yielding reliable crop eminently suited to large areas in Northern Rhodesia. Varieties must be standardised, growing techniques must be improved and production must be increased to justify the milling equipment necessary for a high quality product; these matters are receiving attention.

Cotton.

27. Improved prices have revived interest in this valuable rotation crop. There are two main areas of production, the Upper Luangwa Valley in the Eastern Province, which is the most important area of African production, and Mazabuka District on the line of rail for European production. The following table indicates the expansion of the industry in the Eastern Province:

EASTERN PROVINCE COTTON PRODUCTION.

					No. of growers	lb. Seed cotton
1949 ...	...	...	...	...	118	7,450
1950 ...	...	...	...	...	300	31,000
1951 ...	...	...	...	...	350	33,000
1952 ...	...	...	...	...	900	75,000

Fivepence per lb. has been paid to producers for clean cotton and 2½d. per lb. for stained cotton. The strict enforcement of 1st August as the date for uprooting and burning old cotton plants seems to be proving satisfactory in controlling insect pests. The crop was ginned at Jumbé; next year the machinery will be moved to Fort Jameson. The lint is exported to South Africa via Nyasaland.

28. A total of 240,382 lb. of seed cotton was produced on 778 acres by fifty-three European farms on the line of rail and sold to the Cotton Research and Industry Board, Gatooma, Southern Rhodesia, which supplied the seed. The price received for first quality was 11½d. per lb. and 10½d. per lb. for second quality.

Potatoes and Onions.

29. The production of potatoes and onions on European farms is steadily increasing particularly under irrigation in the area around Lusaka. Attention is being given to marketing problems.

Cassava.

30. Cassava holds its place as an important food reserve crop, particularly in the Northern, Western, North-Western and Barotse Provinces. Some 125 tons of cassava meal were imported into the Mongu and Kalabo Districts of Barotse from Balovale and Kabompo. Six hundred and eighty-three tons of cassava meal were sold in the Bangweulu-Luapula area.

Sorghum.

31. Sorghum is an important subsistence crop in many parts of the country with a special cash value for the urban beer halls. The season was not favourable for its growth and few statistics are available upon the movement of surpluses. The imported dwarf sorghums grown on European farms have not given satisfactory returns, but the season was abnormal and many farmers are giving them a further trial in the coming year.

PART II.—THE WORK OF THE DEPARTMENT.

General Policy.

32. The general policy of the department is to develop and to stabilise European and African agriculture in order to ensure as great a measure of self-sufficiency in territorial food supplies as possible, combined with a high level of farming prosperity.

33. In European farming areas the aim is to encourage a higher standard of farming by attention to:

- (i) Soil fertility through regular green cropping and the sound use of fertilisers.
- (ii) Attention to quality and yield in tobacco by concentration on moderate acreages and greater care in handling.
- (iii) Diversification of cropping to spread economy away from monoculture in maize or tobacco.
- (iv) Soil and water conservation and the use of irrigation.
- (v) Grassland management and mixed farming.

A measure of the task before us can be judged from the following statistics pertaining to European agriculture in Northern Rhodesia in 1950-51 which have been extracted from a report published by the Central African Statistical Office:

Total area of European farms	...	...	...	...	4,136,156 acres.
Total area under cultivation	...	...	...	...	191,896 acres.
Total area planted in maize	...	...	...	...	102,185 acres.
Total area green cropped	...	...	...	...	36,017 acres.
Total area planted in tobacco	...	...	...	...	22,290 acres.
Total area dressed with farmyard manure...	...	...	...	...	8,949 acres.
Total area protected with conservation works	...	...	...	...	62,492 acres.
Total area under irrigation works	...	...	...	...	3,902 acres.
Numbers of cattle	...	...	...	...	127,387
Numbers of sheep and goats	...	...	...	...	6,511
Numbers of pigs	...	...	...	...	6,614

It will be noted that only one-twentieth of the alienated land is in cultivation and of this more than half is planted to maize and between one-fifth and one-sixth only is green cropped.

34. In African farming areas the aims are broadly:

- (i) To stabilise the population on the better areas of soil through planned development and the introduction of permanent systems of farming.
- (ii) The protection of natural resources by land use planning on watersheds, controlled clearing, fire control, contour farming, rotation of crops, mixed farming, rewards for good farming practices, replacement of sledges by carts, development of water supplies, controlled grazing and generally to facilitate the change-over from a subsistence to a cash economy without endangering the soil.
- (iii) To improve living standards by the encouragement of new crops to provide greater variety and quality in the diet and cash crops, particularly food cash crops such as rice and groundnuts, which provide a safeguard against famine and a return on development capital.
- (iv) To provide loan capital for development in suitable areas under control of the native authorities.

Staff and Organisation.

35. The administrative and extension branches of the department are organised on a territorial basis corresponding with the main political subdivisions of the country. A small headquarter staff is maintained at Lusaka consisting of the Director, Deputy Director, Chief Agricultural Officer, Chief Conservation Officer and Chief Tobacco Adviser, together with clerical and accounting staff. The main body of the general agricultural staff, consisting of one Chief Agricultural Officer, ten Agricultural Officers, forty-eight Agricultural Supervisors, 126 African Agricultural Assistants and 235 African Agricultural Capitaos, is distributed throughout the six main provinces as shown in the staff list. Vacancies exist for seven Agricultural Officers against which three provisional appointments have been made, two being available at the end of 1953 and one at the end of 1954. There are vacancies for ten Agricultural Supervisors, but these cannot be filled until more Agricultural Officers are available in the field. In each of three provinces, the Southern, the Northern and Barotseland, only one Agricultural Officer is stationed, making continuity with leave incidence impossible.

36. Specialist services were available during the year as follows:

- (a) Research staff based upon the Central Research Station, Mount Makulu, consisting of the Agricultural Chemist, Soil Scientist and Senior Agricultural Officer (Irrigation). A Plant Pathologist and Pasture Research Officer are due to arrive early in 1953. An Ecologist is undergoing training in Kenya and will be available at the end of 1953 and a Plant Breeder is promised in 1954. In the absence of a Chief Research Officer, the Deputy Director has been co-ordinating the work of the research staff.
- (b) Conservation Service, consisting of a Chief Conservation Officer and four Conservation Officers, with workshop and maintenance staff. Vacancies existed for three Conservation Officers at the end of the year. Four Agricultural Supervisors have been seconded as Conservation Assistants.
- (c) Tobacco Advisory Service, consisting of a Chief Tobacco Adviser with two Assistant Tobacco Advisers and two Agricultural Supervisors in charge of tobacco experiment stations at Choma and Fort Jameson. Two additional Assistant Tobacco Advisers have been approved for appointment in 1953.

Specialist staff work through the provincial staff in the advisory aspects of their work.

Staff Changes.

37. The retirement and transfer since the war of so many experienced officers and the slow rate of intake of Agricultural Officers have left the department very short-handed at a time when emphasis is upon development. In an effort to compete with the demands made upon our time the vanette has tended to replace the tent as an article of touring equipment and Agricultural Supervisors have been called upon to carry out work for which Agricultural Officers are trained. There have been numerous staff changes during the year. C. W. Lynn, M.B.E., assumed duty as Director on 1st February; M. Halcrow, O.B.E., Deputy Director, who had been Acting Director since the departure of J. C. Eyre on 20th June, 1951, reverted to his substantive appointment. Three Conservation Officers were appointed but two were lost, one through resignation, the other by termination of appointment. One Agricultural Officer, an Assistant Tobacco Adviser and seventeen Agricultural Supervisors were appointed during the year; one Agricultural Supervisor resigned.

Extension Services for European Farming.

38. The senior officers in charge of the Southern, Central, Western, Northern and Eastern Provinces, have been responsible for such general extension work as has been possible in addition to their administrative duties. The position has been eased by the closer integration of the work of departmental officers—Assistant Tobacco Advisers and Conservation Officers—on a provincial basis, and by the co-operation of the Land Settlement Officers of the Land Board which is much appreciated. Land Board matters, particularly the Copperbelt Screening and Advisory Committee of which the Chief Agricultural Officer, Western Province, is Chairman, and the collection of annual agricultural statistics, which this year was carried out on a provincial level, have been time-consuming, but ensured many contacts with the European farming community. An advisory service in horticulture, fruit, vegetables and bee-keeping is being developed based upon Kambowa Sub-tropical Fruit and Agricultural Station. This is of special value to the Copperbelt. It must be admitted that only the fringe of general extension has so far been touched; the position will be greatly improved as the research staff becomes established.

39. Tobacco farmers have been reasonably well served during the year with an Assistant Tobacco Adviser stationed in Fort Jameson and an experienced Agricultural Supervisor available for extension at Choma, who was later transferred to Broken Hill and replaced by a newly appointed Assistant Tobacco Adviser recruited from Tanganyika. The part-time services of a retired Senior Agricultural Officer were again available to the farmers in Mkushi Block. In addition the Chief Tobacco Adviser made many individual visits and contacted many groups of growers in different parts of the country. Sixteen pounds of tobacco seed was treated and sold from Msekera Station in the Eastern Province and 132 lb. of locally-grown seed was cleaned and disinfected.

Conservation.

40. The year has been a busy and a difficult one for the Conservation Service which has worked largely, but not entirely, in European farming areas. Enthusiastic Intensive Conservation Area Committees have been continually demanding attention in excess of ability to comply. The high intensities of rain severely tested recently constructed works and found the weaknesses in a number of the dams in the Broken Hill area necessitating loss of time and funds on repairs. Staff changes, difficulties in recruitment and spare parts problems have added to the task of achieving a reasonable level of efficiency. It would be misleading, however, if emphasis upon the difficulties masks the fact that much good work has been achieved during the year.

41. Conservation staff and equipment were distributed as follows at the close of the year:

A.—Central Province:

- (i) Broken Hill—Chisamba area: Conservation Officer and Assistant, one D.8 and three D.7 tractors and equipment.
- (ii) Lusaka—Kafue area: Conservation Officer, one D.6 and two VR. 180 tractors and equipment.

B.—Southern Province:

- (i) Mazabuka—Magoye—Monze area: two Conservation Officers, one Assistant, one D.8 and three D.7 tractors and equipment.
- (ii) Choma—Kalomo—Livingstone area: Conservation Officer who is also the Planning Officer for the province, and one Assistant, motorised grader, three light diesel tractors in I.C.A. unit.

C.—Eastern Province: One Conservation Officer on preliminary reconnaissance.

Workshop facilities are centralised near Lusaka. The two Vickers Rolls 180 tractors were received in October.

42. The following is a summary of work planned and carried out by or under the direction of the Conservation Section in 1952:

Contouring by farmers	...	...	...	...	1,358 acres.
Storm drains	...	...	...	...	31,038 yards.
Buffer dams	...	...	...	...	70
Contour ridges	...	...	...	...	62,190 yards.
Water meadow guide banks	...	...	...	...	11,480 yards.
Fence lines and fire guards	...	...	...	...	17 miles.
Roads	...	...	...	...	2 miles.
Subsoiling (ripping)	...	...	...	...	304 acres.
Bush clearing	...	...	...	...	1,305 acres.
Windrowing	...	...	...	...	35 acres.
Dams	...	...	...	...	9
Capacity of nine dams	...	...	...	...	30,500,000 galls.
Bunded tanks and ponds	...	...	...	...	12

In addition, sixty miles of contour lines and three miles of storm drains protecting 1,110 acres of cultivated land, were demarcated upon nineteen European farms in the Eastern Province.

43. Work on a pilot watershed scheme was started on the headwaters of the Kaleya River at Mapangazia in September. The area is of particular importance because it comprises 7,815 acres of the densely populated and heavily stocked Tonga Native Reserve No. XI in Chief Mwenda's country, Mazabuka District, and continues down into European farms some 16,000 acres of which are included within the planning area. The native section has been subdivided into a north arable area of 1,550 acres, a central grazing and residential area of 2,800 acres and a south arable area of 3,465 acres. By the close of the year, 22,000 yards of graded contour bank and 980 yards of contoured road had been made in the north arable area, 4,000 yards of storm drain, thirty-eight buffer dams and 2,649 yards of access road on the central grazing area for an overall cost of £3,537. The attitude of the people in the area to this work has so far been one of passive acquiescence. The soil in the area is potentially productive and well worth saving from ruination apart from its critical position on the watershed. Experience gained in the planning and operation of this scheme will be of value in guiding similar work on other catchments and it is being especially studied and recorded with this object in view.

44. The cost of conservation work with the heavy equipment has received special consideration during the year. From the start of the work in 1949 until the end of 1952, the revenue earned has been only £65,330 against a total operating cost of £118,270, which includes the sum of £39,157 for depreciation, thus showing a formidable loss of £52,940. Undoubtedly charges have been inadequate, but the main losses come from a variety of causes such as uneconomic small jobs on individual farms which result from farmers trying to meet long-term capital development from current earnings, tractors standing for lack of spares, and inefficient operators who come and go too quickly.

45. Matters of conservation policy were discussed at a joint meeting of the Natural Resources Board and representatives of Intensive Conservation Area Committees held in Lusaka on 15th October. It was agreed that the time had come to break away from an *ad hoc* approach to conservation on an individual farm basis, and to distinguish between the following aspects of the conservation programme:

- (a) Regional Conservation—major training works planned upon a watershed basis regardless of ownership boundaries. Heavy machinery would be required for the mechanical aspects of this work. Special financial assistance would be needed as a capital investment of national benefit.
- (b) Farm Conservation—essentially the application of good husbandry principles carried out by the farmer himself using his own or hired I.C.A. equipment.
- (c) Bush Clearing—to be carried out at cost by specially equipped heavy units in the rainy season.

46. In African areas conservation continues to be one of the main functions of the agricultural field staff. The following brief outline indicates the year's accomplishments, province by province:

NORTHERN PROVINCE.

47. Approximately 300 miles of contour lines were demarcated in the Isoka and Kasama Districts. Four small seepage dams were constructed in Isoka District, one in Abercorn and another in Kasama was extended. Early burning was successfully controlled. Special attention has been paid to the headwater areas of the Luangwa River in Isoka District by the Provincial Team.

WESTERN PROVINCE.

48. Early burning carried out by native authorities with the assistance of departmental field staff was the main conservation measure. Attention has been paid to the protection of river banks and dambos and contour ridges have been pegged through farms where necessary. A start was made during the year upon a survey of the Kafue headwater area in Solwezi District in co-operation with the Forestry Department.

CENTRAL PROVINCE.

49. In the Keembe and south-west Broken Hill area, sixty miles of contour bunds have been demarcated and thirty miles of dambo lines. One "T" dam was constructed. In the Chibili, Badungu

and Nangoma valley, a start has been made upon demarcating level grass strips and dambo lines. Contour ridges have been put in with a Ferguson terracer on Improved Farmers' lands in the Sala Reserve. Contour ridging has been started in the Soli Reserve, but has met with some opposition.

SOUTHERN PROVINCE.

50. Extensive maize production makes the Southern Province a particularly vulnerable area for accelerated erosion. Aerial observation indicates that the situation is well in hand in arable lands; overgrazing on grasslands poses complicated problems which are receiving the active consideration of the Provincial Team. The main accomplishments of the department during the year are as follows:

- (i) Fourteen Ferguson tractors fitted with disc terracers have built contour ridges at two foot six inches vertical intervals during the year at—

						Miles
Mapangazia	...	...	...	...	...	268
Monze	...	...	...	...	...	100
Kanchomba	...	...	...	...	...	20
Mapanza	...	...	...	...	...	50
Total						438

- (ii) Contoured grass strips have been demarcated in land with more gentle slopes and 241 miles were marked in the Magoye area. Cultivation limits to protect river banks and drainage channels have been marked on thirty miles of river in Magoye, 500 miles in Kanchomba and along the Munyake in Mapanza. Ten miles of graded contour banks were erected by hand in hilly land east of Kanchomba at a cost of £2 12s. 0d. per acre.
- (iii) Four masonry weirs and two dams were built at Mapangazia, one dam in Monze area, two at Mapanza and two in Kanchomba. The lighter tractors with scrapers have been used for dam construction very effectively where oxen and dam scoops were not available.

EASTERN PROVINCE.

51. Further progress can be reported from the Eastern Province where the policy of pegging level contour ridges in the dry season, to be finished by the cultivator in the rains, has been continued. Contour ridge cultivation, known locally as "mizera", is then enforced by native authority orders between the main ridges in place of the traditional mound cultivation. The major part of the plateau area is now protected and this year work was concentrated upon six remaining Angoni chieftaincies, and a small South Chewa area near Katete. Some difficulties were encountered during the year both amongst Angoni and Chewa which have slowed the programme down. The following table shows the present position in the province.

African Cultivated Land under Contour Cultivation in the Eastern Province, 1952.

				No. of villages 1952	Estimated acreage protected	Total No. of villages to date
Fort Jameson:						
Katete	...	...	...	147	22,000	590
Kalichero	...	...	...	—	—	371
Chadiza	...	...	...	138	23,000	370
Petauke	...	...	...	170	25,000	630
Lundazi	...	...	...	175	25,000	466
				630	95,000 ac.	2,427

All villages in the Petauke plateau area, Kalichero, the South Chewa area of Chadiza, and a large part of Lundazi District are now practising contour cultivation. Early burning, the protection of hillsides and water courses, and gully control also received attention.

BAROTSELAND.

52. The tracing of bund lines for rice paddies, and the construction and maintenance of drainage ditches and canals in the fertile seepage soils known locally as "sishanjo" were the main conservation activities during the year in Barotseland.

Extension Services for African Farming.

53. The field staff of the department carries out a variety of duties in native areas such as crop and vegetation surveys, supervision of demonstration plots, advisory work in school gardens, organisation of supplies of planting material, and the laying-out of minor conservation works. Special regional policies receive attention such as "chitemene" control, i.e. controlled shifting forest fallow in the Northern Province, the extension and supervision of the African Farming Improvement Scheme in Maize Control Board areas, and peasant farming groups in other economically accessible areas. Further demands are continually being made for attention to development in new areas for the protection of natural resources, or the relief of distressed areas, but staff shortage limits expansion. Regrettably few outstanding Africans choose work of this nature and the department has to recruit European staff for the purpose. A notable exception, Richard Nyirenda, B.E.M., African Agricultural Assistant, must be mentioned; he is achieving outstanding success at Keembe in the Broken Hill District of the Central Province.

54. Twenty-eight agricultural stations provide extension bases as follows:

Northern Province	...	Kasama, Lunzuwa, Isoka (Old Fife), Fort Rosebery, Samfya, Kawambwa.
Western Province	...	Ndola, Kambowa, Kabompo.
Central Province	...	Broken Hill, Serenje, Keembe, Mumbwa, Government Farm Chalimbana, Shibuyunji (Sala).
Southern Province	...	Monze, Magoye, Mapangazia, Kanchomba, Mapanza, Gwembe.
Eastern Province	...	Fort Jameson, Lundazi, Kalichero, Chadiza, Katete, Petauke.
Barotseland	...	Namushakende.

There are in addition, a number of small seed farms and an increasing number of African Agricultural Assistants stationed at extension centres away from agricultural stations.

African Farming Improvement Schemes.

55. Good progress can be recorded with the betterment scheme operated in Maize Control Board areas in the Southern and Central Provinces. The number of registered farmers receiving bonuses for carrying out approved farming practices has increased during the last four years as follows:

			1950	1951	1952	1953
Registered farmers	...	...	262	455	756	847
Bonus paid	...	...	£3,480	£6,515	£13,157	—

The crops of improved farmers were outstanding and an important feature of the scheme is its demonstrational value. The sale of 500 carts was subsidised to the extent of 50 per cent. of the purchase price. A total of 3,210 pockets of super and raw phosphate fertiliser were distributed by the department, and many bags of legume seed—sunnhemp, groundnuts and cowpeas—were given out on a replacement basis.

56. Works of general benefit to the community have included contour ridging with light tractors and mid-mounted disc terracers and the construction of weirs and dams. Some attention has been paid to roads and to the maintenance and improvement of rural buying depots. The total expenditure for the year was approximately £87,000 which was slightly in excess of the net amount paid into the fund by the Maize Control Board. The balance in the fund at the end of the year stood at £154,390. (Figures subject to final statement from Accountant-General.) The scheme has the serious disadvantage of requiring much European supervision, and attention is being given to ways in which farmers themselves may become more responsible for such details as the distribution of fertiliser, possibly on a group basis. A senior agricultural officer started a critical investigation into the workings of the scheme towards the close of the year.

57. The Eastern Province African Farming Improvement Scheme will come into force in 1953 with the useful balance of £26,928 in hand derived from a cess on maize purchased by the Eastern Province Pool in 1950–51 and 1951–52. It is intended that the fund should be used, as on the line of rail, for such purposes as manuring bonuses, subsidies on carts, grants for approved cattle kraals, soil conservation works, water supplies, stumping loans and the purchase of processing machinery for groundnuts.

Peasant Farming Scheme.

58. Under this scheme which so far has been developed outside Maize Control areas, peasants are settled on farms in planned blocks, and capital is provided in the form of a loan from the Development Authority. Where soil conditions are good and where the blocks are situated within economic transport range of a market the results obtained have been so encouraging as to justify consideration of means for its rapid expansion as part of a long-term plan of African farming development. Progress is discussed below province by province.

EASTERN PROVINCE.

59. Peasant farming has been most successful in the development area at Katete where a new block has been opened each year for the past four years comprising a total of thirty-four farms. The position in 1952 is summarised as follows:

PEASANT FARM PRODUCTION, 1951–52.

Group	Farms	Year	Produce sold 1952 (bags)			Average per farm		
			Maize	Ground-nuts	Rice	Income £	Loan £	Balance £
Kawaza ...	10	4th	233	119	17	60	131	70
Walabwe ...	6	3rd	9	83	30	48	80	56
Sinda ...	10	2nd	74	172	—	101	83*	60
Kanyenga ...	9	1st	Not	available		70	78*	75

* The loan will be increased at Sinda and Kanyenga to allow of more clearing.

All farmers have made substantial repayments and the standard of husbandry improved each year. The first year is difficult when the labour is heavy and the return small. Enthusiasm is shown for this scheme by the farmers, who have little difficulty in managing their farms after the first year. Experience suggests that the optimum area of land under cultivation is fifteen acres. The Provincial Agricultural Officer reports: "The African rural community and native authority in particular appear to be taking a great interest in the development of peasant farming and much of the suspicion noticeable in the past is being replaced by a keenness and desire to take part in the scheme." Credit is due to the Area Development Team responsible for the control of the scheme.

60. Three peasant farming blocks are now being opened up in Petauke, comprising thirty-four farms; of these, sixteen were occupied in 1952, and seven individual farms outside the blocks, so-called "satellite" farms, have been brought into the scheme. Three blocks each of ten farms were opened up in the Fort Jameson District during the year, giving a total of eighty-two farms occupied in the Eastern Province.

CENTRAL PROVINCE.

61. Peasant farming blocks are established in Serenje District and more recently in Mkushi, Mumbwa and Keembe in south Broken Hill Districts. A total of fifty-eight farmers are occupying seven blocks near Serenje upon poor plateau soils characteristic of the district. The average cash income per farmer was £10 5s. 0d. derived mainly from the sale of kaffir corn. Two enterprising individuals sold potatoes to the value of £71 and £40 respectively. The area of each farm has been increased from ten to twenty acres in three of the blocks this year. Emphasis is being placed upon the use of farmyard manure. A cautious view of developments in Serenje is advisable at this stage; having regard to the poor soil conditions and the local alternative of small circle "chitemene" cultivation, it may be claimed that reasonable progress has been made.

62. Three farms are now occupied in a newly established peasant block at Munsakamba, near Chiwele in Mkushi District. Political interference has slowed up further development there for the present. Six farmers have moved into a block of twenty farms at Chibila near to Mumbwa. Progress has been slower here than anticipated. Three farmers have been established in a block alongside the agricultural sub-station at Keembe in south-west Broken Hill. Of this area the Provincial Agricultural Officer records: "Progress would have been better had there been no interference from politically-minded younger generation Africans whose biased preaching of the evils of the European administration is acting as a brake on genuine progress."

WESTERN PROVINCE.

63. Two peasant blocks are in course of establishment in the Western Province, one at Ndoba near Lake Bangweulu in Fort Rosebery District, the other at Mushota, forty miles east of Kawambwa. A block of nine holdings of twelve acres each has been demarcated at Ndoba and eight tenants were in occupation, one of whom was subsequently killed by lightning. Three acres have so far been cleared on each holding at an average cost of £8 8s. 9d. per acre. Heifers have been issued and oxen will be issued in time for ploughing in 1953. A course in ploughing and animal husbandry will be given at Samfya Agricultural Station. At Mushota a block of ten peasant farms has been demarcated and nine have been taken up. Three acres on each farm have been cleared, two by Government at an average cost of £2 7s. 0d. per acre, and one by the farmer himself. Cattle kraals are being erected and a full start will be made in 1953.

NORTHERN PROVINCE.

64. There are two peasant farming groups in the Northern Province, Mwambala in the Abercorn District with twenty-six farmers, and an irrigated settlement at Ngulula near Kasama with ten farmers. In addition, six irrigated farms at Mukosa near the Malole Mission function as a group although no leases have been signed. The Mwambala group, which is thirty-eight miles from its market at Abercorn, has not fulfilled its earlier promise: seven farms were flooded and the nineteen remaining farms produced less than three bags of grain per acre from 114 acres in cultivation; the average income was only £6 per head. The Ngulula group had an unfortunate year as a result of a severe hail storm; the average income was only £4 0s. 10d. per head and food had to be purchased. The Mukosa farmers did better by achieving an average income of £40 mainly from the sale of potatoes and wheat to the mission.

"Chitemene" Control.

65. This service has been continued in parts of Abercorn, Mporokoso and Isoka Districts, whereby limited areas available for clearing annually are demarcated in village lands. Slowly the hoe is replacing the axe. It is felt that the time has come when the native authority should take over this routine work and free the Agricultural Supervisor for other things.

School Farms and Gardens.

66. Close contact has been maintained with school farms in an advisory capacity in all provinces. In the Northern Province a school farm competition was held. In the Southern Province thirty-one school farms follow the Improved Farmers' rotation. Special attention has been given to the layout of school farms in the Broken Hill District of the Central Province, and in Barotseland. In the Eastern Province twenty-two middle and upper schools have their gardens regularly visited by a European member of the staff and there are many other primary schools visited by Agricultural Assistants. Considerable importance is attached to the opportunity for influencing the agricultural standards of the literates of the next generation and the department is grateful for the excellent co-operation received from the Department of African Education and the missions.

Agricultural Education.

67. The three African Agricultural Training Centres, designed primarily for the training of Agricultural Assistants for the department, have settled down and passed most of their teething troubles. Difficulty has been experienced in recruiting suitable trainees and staffing problems have necessitated more changes than desirable, the position was more satisfactory in this respect at the close of the year. A valuable contribution is being made to the junior staff in the department and some very useful lads have been trained. It is regrettable that Africans of suitable educational standards and character are not more attracted to agricultural work for there are few ways in which they can make a better contribution. The main features of each school year are given below.

68. The third course at Monze Training Centre in the Southern Province graduated in May, 1952: twenty-one students received certificates out of thirty-one who started the course. Of the thirty-six students commencing the fourth course in November, 1951, only twenty-nine remained at the end of their first year. The wastage is high and reflects perhaps to some extent the teaching difficulties. The position appears to be much improved under a new principal. Electric current has made possible the use of a cinematograph projector which is proving useful and popular.

69. The first course of students at Lunzuwa Training Centre in the Northern Province took final examinations in May, 1952, eighteen passed and received certificates and two failed. Successful students were posted to the Western, Central and Northern Provinces as Agricultural Assistants. In the second course, sixteen students successfully passed their second year tests. Of the thirty-five boys entering the third course in November, 1952, one was dismissed, one discharged medically unfit, and five left because the work was too hard or differed from their expectations.

70. The second course of five students completed their training at Katete Training Centre in the Eastern Province, of whom three passed the final examinations; five out of seven students in the third course entered their second year; and of the eleven students who started the fourth course in November, 1952, one had already fallen by the wayside by the end of the year.

71. The arrangement with Gwebi Agricultural College in Southern Rhodesia, whereby three places are reserved annually for European youths from Northern Rhodesia, has continued and three students took up residence in October. Two of the previous year's entry failed to pass the first year tests.

Research Services.

Mount Makulu Central Agricultural Research Station.

72. The main work was centred round the building programme. Difficulty was experienced in obtaining the services of African artisans, especially carpenters. Despite this and other difficulties the programme went ahead slowly but surely, e.g.:

- (i) One A.K.3 residence completed and occupied.
- (ii) Two A.K.3 residences started and completed, and ready for occupation except for the servants' quarters.
- (iii) A well-planned chemical laboratory sixty feet by sixty feet was started and by the end of the year all the brickwork was completed and the roof put on.
- (iv) The semi-permanent house occupied by the European Building Foreman was partly reconstructed and extended.
- (v) Three two-roomed African houses were built.
- (vi) One 7,000 gallon water reservoir was constructed in brick and cement and 1,250 feet of main and supply pipe were laid.
- (vii) 320,000 bricks were made and burnt on the station.

73. Negotiations with Messrs. Chilanga Cement Limited for the installation of an overhead line and a supply of electric power were continued with the assistance of the Chief Electrical Engineer, Public Works Department. It is hoped that the electricity will be available on the station within a few months.

74. A good deal of general work was done on the station which included pegging further lands on the contour for strip cropping and clearing and thinning bush on grassland to facilitate mowing, 200 flowering trees were planted on the European and African residential sites, one mile of farm road was realigned and some 200 acres of land were under the plough, including fifty acres of maize and 150 acres of green manure crops all on the contour.

75. No progress was possible with the development of the proposed research sub-station except insofar as discussions took place from time to time with architects of the Public Works Department regarding the plans for a joint inter-departmental station to be established at Samfya on the west side of Lake Bangweulu. The planning has reached an advanced stage and some preliminary work on the ground has been started.

76. On the recurrent side, there were only two specialist officers, namely an Agricultural Chemist and a Soil Scientist on the strength.

77. The Agricultural Chemist was away on overseas leave for six months. Work was concentrated on finding the answers to problems of fertilising the main crops on the main soil types, i.e. maize and tobacco on the line of rail and in the Eastern Province. To this end the Chemist formulated a series of standard designs of experiments which were carried out at the various agricultural stations throughout the areas, the current results of which are included below under the province concerned. When the results of the work of the 1952-53 season are available the Chemist will write up a comprehensive report on the conclusions to be drawn from the results of the past three years and a guide to the use of fertilisers for maize will be published for the use of farmers.

78. The Soil Scientist had a busy year investigating the soil conditions of an area in the Gwembe Valley near Chirundu in connection with a pilot sugar cane growing scheme. He also made a start on a soil survey of the Kafue Flats.

Research and Experimental Work.

79. In some ways it was a disappointing season. The rains after being heavy and continuous at one stage suddenly ceased altogether at the beginning of March, so that many experimental plots after being waterlogged subsequently dried out extremely rapidly leaving the soil caked hard like concrete. It was therefore to be expected that much careful work was wasted, but despite the difficulties some valuable progress was made.

EASTERN PROVINCE.

Flue-cured Virginia Tobacco.

80. At Msekera Tobacco Station a trial of the effect of compost at five tons and ten tons per acre respectively, as a means of offsetting the adverse effect of eelworm infestation seemed to indicate that compost had relatively little or no effect on the yield as compared with no compost at all.

81. A comparison of three rates of application of Tobacco A mixture (6:10:8) on Bonanza tobacco at Msekera gave the following approximate yields of cured leaf per acre:

	Cured leaf (lb./ac.)
Nil... ..	400
200 lb. Tobacco A per acre	750
350 lb. Tobacco A per acre	800
600 lb. Tobacco A per acre	1,000

In each, the fertiliser was applied in three dressings, viz. pre-planting, three to four weeks after planting and six to seven weeks after planting. These results are in line with the results of a similar experiment carried out last year.

82. A comparison of nine different mixtures, i.e. varying proportions of N, P and K carried out at Msekera with Bonanza gave the following indications:

Mixtures							Weight cured leaf (lb./ac.)
(N.	P.	K.)					
3	13	9	...	...	...	...	843
5	9½	15	...	...	...	...	850
6	10	9	...	...	...	...	1,040
6	13	3	...	...	...	...	1,000
7	18	12	...	...	...	...	1,136
8½	8½	9	...	...	...	...	994
9½	7½	9	...	...	...	...	988
10½	6½	9	...	...	...	...	942
10½	7½	6	...	...	...	...	1,046
Control—no fertiliser			...	...	...	...	440

All mixtures were applied in the same way at the same rate, namely 350 lb./ac. While it would be unwise to draw conclusions on the basis of one year's results except of course the obviously highly significant increase in yield from the use of fertiliser as compared with no fertiliser at all, there was an indication that the level of nitrogen was an important factor.

Burley Tobacco.

83. A variety trial on Burley tobacco at Petauke showed that the highest yielding varieties were "Kentucky 41" and "Barnet Special" while the poorest varieties were "Harrow Velvet" and "White Burley". This result was surprising insofar as "White Burley" has generally done extremely well in previous trials and it illustrates the danger inherent in publishing the results of trials on the basis of only one or two years.

Maize.

84. The effect of fertilisers on yields of maize was investigated on a very poor sandveld at Katete and on the relatively very good soil conditions at Petauke. The fertiliser treatments comprised all possible combinations of normal levels of nitrogen, phosphate and potash; the phosphate and potash being applied at planting while the nitrogen as sulphate of ammonia was applied as a top dressing six weeks after planting. At Katete the outcome of the experiment was that phosphate and potash had no effect while nitrogen had a considerable effect, as shown by the following yield figures:

Treatment	Yield of maize (bags per acre)
200 lb. Sulphate of ammonia per acre	7.6
Control—no nitrogen	2.7

At Petauke the mean yield of the experiment as a whole was very good indeed at 19.7 bags per acre. Again there was no effect at all from phosphate and potash and there was only a very slight increase in yield due to the application of sulphate of ammonia. In this case the maize crop followed a previous crop of Burley tobacco, on extremely good soil.

Groundnuts.

85. In fertiliser trials, including phosphate, potash and lime, on groundnuts at Katete and Petauke, there were no significant effects on the yield of kernels; there was an indication of some effect due to phosphate at Katete as the following figures indicate:

	Yield (lb. kernels per acre)
Fertilised with 200 lb. phosphate/acre	740
Control—no fertiliser	633

At Petauke the mean yield in the groundnuts trial worked out at a rate of 917 lb. kernels per acre.

Cotton.

86. In the Upper Luangwa Valley three series of experiments were carried out in connection with cotton. The first of these confirmed that early planting gives the highest yields. There was no significant difference, however, between three planting dates in December which were all significantly better than the 8th January planting. Stainer damage was more or less a constant weight and therefore there was proportionately greater loss with the late planted crop. Trials of four variations in spacing indicated that three feet by one foot gave the highest yield but the difference was not significant. The effect of interplanting cotton with groundnuts was a very slight reduction in the yield of cotton; on the other hand the average cash returns worked out at £17 1s. 0d. per acre from the combined cotton and groundnut crops as compared with £12. 9s. 0d. per acre from a pure stand of cotton.

Rice.

87. In a trial of twelve varieties of rice at Petauke, two varieties " B.C. 70 " (reputedly from the Belgian Congo) and " Afaa Mwanza " (from Tanganyika) proved most promising from the point of view of early maturity and quality and gave yields at the rate of 4,000 lb. and 3,000 lb. of paddy per acre respectively. Both these varieties matured in 150 days, i.e. nearly a month earlier than the standard local variety " Faya ".

SOUTHERN PROVINCE.

Flue-cured Virginia Tobacco.

88. The effect of applications of Adco compost and kraal manure compost to tobacco on eelworm infested land was as follows:

Treatments						Cured leaf (lb. per acre)
Adco compost 7 tons/ac.	...	...	...	...	...	735
Adco compost 14 tons/ac.	...	...	...	...	...	681
Kraal compost 7 tons/ac.	...	...	...	...	...	897
Kraal compost 14 tons/ac.	...	...	...	...	...	886

The figures indicated that a double application of compost was ineffective and possibly slightly disadvantageous.

89. The effect of various chemical soil fumigants on eelworm infested land was tested by examining the roots of samples of tobacco plants in duplicate plots. The counts clearly indicated some beneficial effect due to all treatments, and methyl bromide in particular was extremely effective in reducing the eelworm attack to negligible proportions.

90. In a trial of eight varieties of flue-cured Virginia tobacco there was no significant difference between " Willow Leaf," " White Stem Orinoco " and " Bonanza " while " C-10. 46 ", " Gold Dollar " and " Jamaica Wrapper " also did well. The variety " Yellow Mammoth " did rather badly.

91. A fertiliser trial to compare different levels of application of standard Tobacco A mixture gave the following results:

Treatment (Tobacco A mixture)						Cured leaf (lb. per acre)
600 lb./ac.	...	...	...	...	...	1,012
200 lb./ac.	...	...	...	...	...	937
350 lb./ac.	...	...	...	...	...	890
Control—no fertiliser	...	...	...	...	...	561

The 200 lb./ac. treatment consisted of 100 lb. pre-fertilised followed by two successive side dressings of 50 lb. each, whereas the 350 lb./ac. treatment consisted of 150 lb. pre-fertilised followed by two side dressings of 100 lb./ac.

92. A trial of nine fertiliser mixtures comprising various proportions of nitrogen, phosphate and potash all applied at the same rate (350 lb.) and in the same way, gave the following results:

Mixtures (N. P. K.)							Weight cured leaf (lb. per acre)
3	13	9	...	...	...	...	1,132
5	9½	15	...	...	...	...	1,248
6	10	9	...	...	...	...	1,209
6	13	3	...	...	...	...	1,112
7	18	12	...	...	...	...	1,484
8½	8½	9	...	...	...	...	1,379
9½	7½	9	...	...	...	...	1,471
10½	6½	9	...	...	...	...	1,300
10½	7½	6	...	...	...	...	1,180
Control—no fertiliser	...	...	...	...	...	...	813

These figures were in line with the results obtained with the same mixtures tried at Msekera in the Eastern Province and clearly indicate the influence of the nitrogen factor. There has so far been no evidence that the increased yields in any way affected the quality of the leaf in these experiments.

Maize.

93. Fertiliser trials using nitrogen, phosphate and potash on maize were carried out at Magoye, Monze and Kanchomba. The phosphate (as 200 lb./ac. super and raw) and potash (as 108 lb. muriate of potash) were applied at planting, while the sulphate of ammonia was applied at 200 lb. per acre as a top dressing six weeks after planting. The most striking effect was due to nitrogen; the results may be summarised as follows:

Mean yield of maize in bags per acre						Remarks
			Plots without nitrogen	Plots with nitrogen		
Magoye ...	...	...	5.5	10.3		Following 3 years fallow.
Monze (i) ...	...	...	13.3	17.4		Following green manure.
Monze (ii)...	...	...	9.2	11.2		Following green manure.
Kanchomba ...	...	...	8.2	13.3		Following green manure.

The effect of applying phosphate at approximately 200 lb. per acre of either super and raw or superphosphate was also substantial and may be summarised as follows:

Mean yield of maize in bags per acre					
			Plots without phosphate	Plots with phosphate	
Magoye...	...	...	6.3	9.3	
Monze (i)	...	...	13.3	17.3	
Monze (ii)	...	...	7.8	12.6	
Kanchomba	...	...	10.9	10.4	

The combined effect of applying both nitrogen and phosphate is illustrated by the following comparative figures based on results at Monze:

				Yields of maize (bags per acre)
With both nitrogen and phosphate	...	...	...	19.6
Control—no fertiliser	...	...	...	10.7

There was no benefit derived from the application of potash.

Hybrid Maize.

94. At all stations, the Southern Rhodesian Double Hybrid maize out-yielded Hickory King by some 10 per cent. to 30 per cent. A replicated trial at Mochipapa gave the following results:

Variety	Yield (bags per acre)
Southern Rhodesian Double Hybrid ...	10.0
Hickory King ...	6.5

Groundnuts.

95. A fertiliser trial with lime, phosphate and potash on groundnuts at Magoye showed no significant effects on yield as compared with control—no fertiliser—plots. The average yield of groundnuts was low, probably due to seasonal conditions, e.g.:

Magoye, Virginia Bunch ...	476 lb. kernels per acre.
Magoye, Natal Common ...	400 lb. kernels per acre.
Mochipapa, Virginia Bunch ...	260 lb. kernels per acre.

Cotton.

96. Yields of cotton on various stations were disappointing:

Magoye...	530 lb. seed cotton per acre.
Monze ...	163 lb. seed cotton per acre.
Kanchomba ...	302 lb. seed cotton per acre.

Sorghum.

97. A field of red "bird-proof" dwarf sorghum at Mochipapa gave seven bags of grain per acre.

Cowpeas.

98. In a variety trial at Magoye the results were:

New Era ...	476 lb. per acre.
D.3 ...	443 lb. per acre.
Saunders Upright ...	315 lb. per acre.

Safflower (852).

99. A plot of safflower that was planted on 3rd March and had no rain nor irrigation thereafter gave a yield of only 85 lb. of seed per acre.

Grass Leys.

100. Four species have been under observation in paddocks for some time, viz:

- Giant Rhodes Grass (*Chloris gayana*).
- Mlanje Grass (*Digitaria milanjensis*).
- Star Grass (*Cynodon plectostachyum*).
- Sabi Grass (*Setaria spp.*).

The last named, i.e. Sabi Grass is useless under the particular sandveld conditions. The other three species, however, are promising. Fertiliser trials have been superimposed on these species, with particular reference to the effect of substantial applications of nitrogenous fertiliser and interesting results should be forthcoming in due course.

CENTRAL PROVINCE.

Maize.

101. In fertiliser trials on maize at Mount Makulu, Chalimbana and Mukalaikwa there was again generally a good response to nitrogen as a top-dressing of 200 lb./ac. (sulphate of ammonia), as the following summary shows:

		<i>Mean yield of maize in bags per acre</i>		<i>Remarks</i>
		<i>Plots without nitrogen</i>	<i>Plots with nitrogen</i>	
Mount Makulu (i)	...	6.8	12.2	Following 1 year fallow.
Mount Makulu (ii)	...	6.0	9.9	Following 1 year fallow.
Chalimbana	...	5.8	8.6	Suffered from waterlogging.
Mukalaikwa	...	3.3	8.2	Following groundnuts.

The response to phosphate again varied according to locality:

		<i>Mean yield of maize in bags per acre</i>	
		<i>Plots without phosphate</i>	<i>Plots with phosphate</i>
Mount Makulu (i)	...	8.9	9.9
Mount Makulu (ii)	...	8.0	8.0
Chalimbana	...	6.0	8.4
Mukalaikwa	...	5.3	6.0

Only the response at Chalimbana was significant. Again there was no effect from potash.

Minor Crops.

102. Many empirical trials of varieties of crops, rotations including grass leys were continued at four centres, namely, Serenje (poor plateau soils), Broken Hill (sandveld), Kembe (good upper valley soil) and Chalimbana (moderate contact soil). Yields were generally poor and reflected the difficulties of the season. Some of the figures were as follows:

<i>Crop</i>	<i>Station</i>	<i>Equivalent yield per acre</i>	<i>Remarks</i>
Wheat	Chalimbana	$\frac{3}{4}$ bag	Average of 6 acres—failure.
Oats	Chalimbana	2 bags	Lampton variety.
Barley	Chalimbana	Nil	Two acres—complete failure.
Groundnuts	Mukalaikwa	Nil	Waterlogged. Natal Common.
Groundnuts	Chalimbana	300 lb. kernels	Natal Common. Much rosette and cercospora.
Groundnuts	Serenje	167 lb. kernels	Four varieties.
Beans	Broken Hill	150 lb.	Canadian Wonder.
Beans	Kembe	216 lb.	Canadian Wonder.
Beans	Serenje	239 lb.	Canadian Wonder.
Sorghum	Kembe	Nil	Four varieties—failed.
Sorghum	Serenje	535 lb.	Local selection.
Sorghum	Serenje	Nil	Radar and other dwarf varieties—failed completely.
Maize	Broken Hill	10 bags	Double Hybrid (fertilised).
Maize	Kembe	16 bags	Double Hybrid (fertilised).
Maize	Serenje	5 bags	Double Hybrid (fertilised).
Irish Potatoes	Kembe	102 bags (150 lb. each)	Up to date.
Irish Potatoes	Chalimbana	80 bags (150 lb. each)	Irrigated.
Sweet Potatoes	Serenje	1,425 lb.	
Cassava	Serenje	8,868 lb.	
Cotton	Broken Hill	600 lb.	
Cotton	Kembe	682 lb.	

Grass Leys.

103. Trials of various grass species were continued at several centres. At Chalimbana the programme was intensified with special reference to irrigated pasture and fodder crops and the effect of fertilisers. The most promising species were Panicum Makarikari, Rhodes Grass, Star Grass and Gold Coast Napier Fodder. This work must be continued for several years before conclusions may be drawn.

Chemical Weed Killer.

104. The Agricultural Officer, Chalimbana, carried out most successful trials of 2-4-D hormone weed killer for the control of (i) weeds in pastures, and (ii) *Royena* sp., a woody shrub that is spreading in certain areas. As a result, a more comprehensive experimental programme including pre-emergence weed control in maize has been planned for next season.

WESTERN PROVINCE.

105. At our Kambowa Station a fertiliser trial on maize following two years of soya beans showed no response to phosphate or potash. The response to nitrogen as a top dressing of 200 lb./ac. of sulphate of ammonia six weeks after planting was more striking than in the lower rainfall areas as shown by the following summary:

		<i>Mean yield of maize in bags per acre</i>		<i>Remarks</i>
		<i>Plots without nitrogen</i>	<i>Plots with nitrogen</i>	
Kambowa	...	11.0	16.8	Following 2 years of soya beans harvested.

This was a most significant increase both from a statistical and a financial point of view.

106. Also at Kambowa, cultural and variety trials with fruit and vegetables were started, which should provide some extremely useful information in due course.

BAROTSELAND.

107. Investigations at Namushakende have shown that the so-called "sishanjo" soil, though more difficult to prepare than the "sitapa" soil, is capable of producing satisfactory crops of paddy. This is illustrated by the following average yields of paddy grown on several acres of the two types of soil:

	Average yield per acre
On "Sishanjo" paddies ...	1,776 lb. paddy.
On "Sitapa" paddies ...	1,225 lb. paddy.

The overall yield was less than in the previous year due to the difficulties of the season.

108. Whereas plots of maize, bulrush millet and other minor crops either did very badly, or failed altogether under the particular seasonal conditions, cassava on the other hand planted in 1949 and harvested in September, 1952, gave yields which varied from 1,276 to 5,148 lb. dried roots per acre with an overall average of 2,870 lb. per acre. These figures illustrate how valuable the cassava crop is in central Barotseland for it seems unlikely that any other crop could compete with it on the loose Kalahari sands.

109. Seeds of eighteen species of indigenous legumes were collected and sown in plots for bulking. Three species, namely, *Desmodium dregeanum*, *Indigofera endecaphylla* and *Ericosoma psoraleoides* were easily established and they will be included with an indigenous leguminous shrub called *Baphia oblongata*, in a trial to test their regenerative effects on the Kalahari sands.

110. Trials of a wide range of crops, fruit and vegetables were continued. Sugar cane, cotton, pigeon peas and Bombay red onions appeared quite promising.

PILOT SCHEMES.

Rice Production.

111. Following up the recommendations of the East African Rice Mission, attention has been given to rice in those parts of the country where conditions are considered to be suitable, notably in Barotseland, parts of the Eastern Province and in the Luapula-Bangweulu area. Seventeen acres of experimental rice land were under cultivation on the agricultural station at Namushakende in Barotseland, with sixteen different varieties and selections under trial. A number of field days and rice demonstrations were arranged and an estimated total of a thousand cultivators has been persuaded to grow rice in various parts of the province, which must be regarded as no mean achievement after only three years' extension work. The two small rice hullers established at Mongu and Mankoya gave a certain amount of trouble due largely to inexperienced handling. The Provincial Team recommended the appointment of a marketing officer to organise disposal of the crops in the future. At present, rice is considered mainly as a cash export crop in Barotseland, but its consumption is slowly developing and it is as a local food crop that it has perhaps its greatest future.

112. Useful experimental work in processing rice has been carried out at Petauke in the Eastern Province in collaboration with the Co-operative Marketing Union; a satisfactory range of small-scale machinery has been decided upon which is capable of turning out a product of export quality. Extension work has been concentrated upon proper bunding of the land and transplanting seedlings in preference to broadcasting seed. One hundred and forty-five bags of improved rice seed of the variety Faya were distributed to cultivators on a replacement basis.

113. In the Luapula-Bangweulu area some attention is being given to experimental plantings in "dambos". A valuable preliminary survey of the rice potential of the vast Luena-Luantita and Pambashye Swamps has been carried out by the Agricultural Supervisor, Kawambwa; the indications are that of some 84,000 acres, less than 2 per cent. would appear to be suitable for rice, the balance for the most part being sandy and acid in reaction.

Oil Palms.

114. The Palm Oil Pilot Scheme in the Luapula Valley is developing slowly according to plan. Selected local seed and Nigeria *Dura* and *Tenera* seed has been planted out into the nursery from the germinator. Seed of the oil palm is particularly difficult to germinate and to date, 765 local, 40 *Dura* and 127 *Tenera* seedlings have been raised. Three three-acre plots near Mulwe have been acquired from the native authority for trial plantings on a field scale, and transplanting from the nursery of the better grown seedlings was started in November. Trial plantings will also be made on the agricultural station at Mubende where irrigation is available.

115. Palm counts in the valley have been held up by political opposition on the mainland, but counts have been completed on Kilwa Island on Lake Mweru and fifty-five palms have been selected for special observation and marked. Spectacular results must not be expected from this oil palm work because the area is not sufficiently tropical to provide ideal conditions for the crop; investigation will show to what extent this valuable oil can make a contribution to the diet of the Territory.

Pilot Groundnut Scheme.

116. The 1951-52 season proved disastrous for the groundnut scheme at Mukalaikwa in the Mumbwa District of the Central Province. Some 470 acres of groundnuts were planted and only a few bags of nuts were reaped. Conditions were very wet, there was 100 per cent. infection of leaf spot (*Cercospora spp.*) and very heavy "rosette" disease in addition: thirty-five acres of maize

by contrast yielded an average of ten bags per acre. We have confirmed the experience of others to the effect that groundnuts in themselves do not represent a farming system, though in suitable circumstances they have a valuable place as a rotation crop. Experience has been gained in the mechanical handling of groundnuts and a reasonably satisfactory system has been evolved; disease is now the limiting factor. The small herd of seventy indigenous cattle running with Afrikander bulls is steadily improving in condition after a number of early set-backs. By the close of the year a broadened cropping programme was put into effect including sorghum, maize and cotton, with emphasis still on groundnuts planted on new land.

Sugar Cane.

117. The irrigated pilot sugar cane project, which the Rhodesia Sugar Refinery Limited is operating as the agents of the Government on a site ten miles west of the Chirundu Bridge on the north bank of the Zambezi River, is progressing according to plan. Some eleven varieties of selected canes have been introduced for trial from Southern Rhodesia and these are being tested and bulked upon thirty acres of land prepared for the purpose. A preliminary fertiliser trial has been laid down. Termites caused trouble with the cane sets, but this has been overcome with BHC and the canes have come away well and look promising. These plantings will provide seed cane for expansion in 1953 upon 350 acres in the second phase of the scheme.

SPECIAL SURVEYS.

(i) Irrigation.

118. A Senior Agricultural Officer, with facility in water matters, has been detailed to review current irrigation practice throughout the Territory and to investigate particularly the irrigation potentialities of the Kafue Flats following up the work of the American scientists, Messrs. Jackson and Foster, who visited the Territory in 1951. Close liaison is maintained with the Department of Water Development and Irrigation and other departments concerned, and the Soil Scientist has been closely associated with the investigations.

(ii) Luapula-Bangweulu.

119. Land use surveys have been continued on the western shores of Lake Bangweulu to locate the better areas for settlement on a permanent farming basis.

(iii) Headwater Protection.

120. Some attention has been given to preliminary surveys of land use on the headwaters of the Luangwa River in Isoka District and the headwaters of the Kafue River in Solwezi, in co-operation with the Forestry Department.

(iv) Cotton Production, Luangwa Valley.

121. A useful report on the progress of cotton growing in the Luangwa Valley in the Eastern Province has been prepared by the Agricultural Officer, Lundazi, which provides basis for future developments.

(v) Land Utilisation Investigation.

122. A detailed classification of the production potential of all land in the Territory under the headings Crown land, native trust land and native reserves, was carried out by the Agricultural Officer, Barotseland, assisted by an African graduate of Fort Hare. Areas of different classes of land were calculated by planimeter from the soil-vegetation map of C. G. Trapnell, O.B.E. The investigation was inspired by a question posed by Mr. John Moffat, O.B.E., M.L.C. Although necessarily approximate, the figures provide an invaluable guide upon an intricate subject.

(vi) Ngwesi River, Kalomo District.

123. Agricultural and Conservation Officers took part in a combined investigation of accelerated soil erosion in Chief Sekute's area on the Ngwesi River north of Livingstone. Detailed proposals were put forward for rehabilitating the area.

Legislation.

124. No new legislation was passed during the year. The following *Gazette* Notices affecting the department were published:

General Notice:	381	...	...	...	Committee to Administer African Farming Improvement Fund.
	131, 231 and 571	...	...	...	Price of African Grown Maize.
	342 and 470	...	...	...	Subsidisation of Fertilisers.
	349	...	...	...	Flood Loans.
	202	...	...	...	Buying Price for Groundnuts.
	202 and 39C	...	...	...	Price of Maize.
	<i>Tobacco Marketing and Levy Ordinance.</i>				
General Notice:	381	...	...	...	Eastern Tobacco Board.
	423	...	...	...	Western Tobacco Board.
	231	...	...	...	Wheat, Producer Price of.

Eastern Province Agriculture Produce (Bill).

Tobacco (Export, Sales by Auction and Compulsory Pooling of the Proceeds of the Sales of Tobacco) (Amendment) (Bill).

Tobacco Marketing and Levy (Amendment) (Bill).

Publicity and Publications.

125. The department sent a number of articles to the Information Department for publication and a new series of African broadcasts was in course of preparation at the close of the year.

126. As in previous years the department mounted a comprehensive exhibit at the Lusaka Show, which included small plots of growing irrigated fodder, grasses, lucerne, wheat, barley and oats effectively planted and tended by the Agricultural Officer, Chalimbana. Exhibits were also arranged at provincial shows.

127. Three departmental Bulletins were published during the year:

Bulletin No. 4. "A Labour Saving Method of Compost Making." By J. R. E. Hindson, B.A., A.I.C.T.A., Senior Agricultural Officer.

Bulletin No. 5. "European Tenant Farming with Special Reference to Share Cropping in Northern Rhodesia." By M. Halcrow, O.B.E., B.SC. AGRIC. (HONS.), DIP. AGRIC. (CANTAB), A.I.C.T.A., Deputy Director of Agriculture.

Bulletin No. 6. "The Production of Turkish Tobacco in Northern Rhodesia." By J. C. Collins, B.SC. (EDIN), Chief Tobacco Adviser.

Visitors.

128. Mr. G. H. Lepper, British Empire Producers' Organisation.

Mr. D. A. Coulson, Imperial Tobacco Co. Ltd.

Mr. Leslie Farrer-Brown, The Nuffield Foundation.

Rt. Hon. C. R. Attlee, O.M., C.H., M.P.

Mr. R. Kettlewell, Director of Agriculture, Nyasaland.

Major G. C. Cameron, O.B.E., Chairman, Southern Rhodesian Cotton Industry Board.

129. In conclusion, I would like to record thanks and gratitude to all the staff of the department, both African and European, for their loyal support and application to duty during the year.

31st March, 1953.

C. W. LYNN,
Director of Agriculture.

APPENDIX.

CONSERVATION SERVICES.

ANNUAL REPORT, 1952.

Staff and General.

During 1952 the work of the Conservation Service continued to be hampered by lack of both technical and mechanical staff. Development and also the damage done by the heavy rainy season in 1951-52, increased the farmers' demand for attention. Only five technical officers, two of whom were newly appointed, were available to serve the needs of the farmers on the line of rail and in the Eastern Province. Establishment allowed for eight as a minimum requirement but, despite continual advertisement, qualified officers would appear to be difficult to attract under existing conditions, and difficult to hold when attracted. As a result, officers and machinery have been dispersed over the countryside in an unsuccessful attempt to keep pace with the growing demands and requirements of Intensive Conservation Area Committees. Under the circumstances both the individual and extensive planned development cannot be catered for, and for the final good of the country, the individual must give way to a planned approach on a state level down through watershed planning to the economic farming unit. An experimental approach was made in the headwaters of the Kaleya, and both staff and equipment are being organised to approach conservation and land utilisation on a regional planned basis.

2. In June, 1952, the Chief Conservation Officer proceeded on leave. The time was unfortunate with such a young organisation. However, during this period the United States of America and the Union of South Africa were visited and conservation developments in those countries were studied in their application to Northern Rhodesia.

3. On account of the heavy rains and damage done to dams, it was decided that normal run-off conditions were not applicable to this Territory and a survey of as many dams as possible was made by the conservation staff. This resulted in valuable information which will, in conjunction with water development findings, guide us in future works until more scientific run-off readings are available.

4. Dam construction demonstrations with wheeled tractors were organised at Choma in conjunction with the Natural Resources Board and with the support of several commercial firms. Much valuable information resulted and commerce is to be congratulated on their interest and assistance in the conservation field. They are no doubt most ready to assist if shown the correct course.

Workshop Centre and Equipment.

5. The development of this vital centre is still unfortunately slow and once again a year passes by, still awaiting staff houses. Foundations are now being laid and it is hoped that a more favourable report will be available next year. Despite the set-back staff has carried out with limited resources all repairs and overhauls of machinery. Although the spares position has slowly improved, serious delay and loss of working hours while spare parts were awaited, have once more hampered the work and affected our financial returns for the year.

6. We welcome two Vickers Rolls tractors from England that arrived towards the close of the year.

Field Operations.

7. The European farming area has continued to be run under the following five groups organised on a provincial basis. By this approach it is hoped to decentralise much of the administration and give greater co-ordination with both the Agricultural Department as a whole, and with the Department of Water Development and Irrigation.

A.—Central Province:

- (1) Broken Hill-Chisamba Group Area.
- (2) Lusaka-Kafue Group Area.

B.—Southern Province:

- (1) Mazabuka-Monze Group Area.
- (2) Choma-Kalomo-Livingstone Group Area.

C.—Eastern Province:

- (1) Fort Jameson Group Area.

8. Fuller responsibilities have been passed to the Intensive Conservation Committees, which advised by the Conservation Service, are responsible for organising the programmes of work.

Planning and Mapping.

9. Although we are still awaiting office accommodation and equipment, much valuable work has been done in the Southern Province in designing the Upper Kaleya Scheme and in preparation for our 1953 approach.

A.—Central Province.

10. Work in this province has been severely hampered by the movement of staff. An average of only 1.5 Conservation Officers has been available for the total area. However, with only three

machines they have done remarkably well in covering the work applied for by the Conservation Committees. Financial loss has been caused through dam repair works on account of unpredictably heavy run-off during the intensive rains of the 1951-1952 season.

Analysis of Work Done.

11. *Conservation Layouts.* Only eighty acres of conservation works have been constructed by farmers, plus a further forty-nine acres of irrigated orchard land. The mechanical units constructed 9,500 yards of heavy storm drains at a total cost of £700 15s. 0d. or £7 7s. 0d. per 100 yards, and 8,500 yards of contour ridging at a cost of £177 5s. 0d. or £2 1s. 0d. per 100 yards. In addition, various other works were completed including fence lines, fire guards, silage pits, roads and experimental sub-soiling.

12. *Planned Bush Clearing.* Seven hundred and seventy-four acres were cleared but not windrowed at a total cost of £2,141 15s. 0d., an average cost of £2 16s. 0d. an acre. Two hundred acres on the Groundnut Scheme in Mumbwa District were cleared, windrowed and Rome disced by a D.8 tractor in 248 hours for a cost of £2,148.

13. *Dams.* Six small dams were built with a total capacity of 12,000,000 gallons, 23,195 cubic yards of earth being moved. Charged at 1s. 5d. a cubic yard, the total cost was £1,934 3s. 11d. including spillway costs. The actual cost on an hourly rate would have been £2,345. This shows a loss of £410 16s. 1d. due to the discrepancy on the estimated 1s. 5d. a cubic yard charge. A further twelve small dams and water sumps were constructed at a cost of £1,892.

14. The units in the Central Province did work over the year to a total value of £17,350.

B.—Southern Province.

15. Three new officers were available in the Southern Province and every effort was made to meet the requirements of the I.C.A. Committees. It has been essential to concentrate on the more detailed mapping and planning approach and the design and construction of the Upper Kaleya Watershed Intensive Conservation Scheme.

Mazabuka-Monze.

16. Eight thousand acres of the African reserve and 14,800 acres of European farmed land have been mapped and planned in the catchment of the Upper Kaleya. The headwaters of this valuable farming area were approaching severe denudation on account of the concentration of African farmers and stock. It was decided that priority should be given to the planning and construction of this intensive conservation scheme in the African area and contiguous European farms. A grant of £8,000 was made by Government to cover 50 per cent. of the cost of essential works, the balance being met by African Development Funds and the European farmers concerned.

Analysis of Works.

17. A unit of two tractors commencing work on 11th September, 1952, completed the following works in the Upper Kaleya by the end of the year:

Storm drains	8,514 yards.
Contour ridges	22,300 yards.
Road construction	980 yards.
Buffer dams	24

The total tractor hours were 970 at a cost of £3,537 15s. 0d. In addition, 374 acres of land were protected with 37,117 yards of ridges constructed by farmers themselves.

18. The Conservation Section has given advice and assistance on conservation problems, dam building, bush clearing, contouring, storm drains and road construction generally throughout the district. Routine inspections of work done by Government units as well as by farmers have been maintained and forty-four farms have been contacted.

19. *Dams.* Three dams totalling 8,494 cubic yards of earth moved, costing £935 10s. 0d. and containing 18,500,000 gallons of water, were completed at respective costs of 1s. 7d., 3s. 1d., 1s. 9d. a cubic yard including spillway costs. The high cost of No. 2 was due to bad working conditions during the rainy season. This was the first job carried out by the D.4 unit and a new operator. In addition, four dams were improved and extended at a cost of £468.

20. *Conservation Layouts.* A total of 294 acres was protected with 31,390 yards of contour ridging by the heavy units at a total cost of £863 15s. 0d. and a price per 150 yards varying from £1 14s. 7d. to £6 1s. 2d. These costs included other works in the nature of ripping between ridges, etc. The actual costs of straightforward ridging varied from £1 14s. 7d. as built by the Adams grader to £2 1s. 4d. A further 855 acres were laid out and protected with 45,370 yards of ridges constructed by the farmers themselves. It is worth noting that the construction of contour ridges by the farmer using farm implements has been found to be more economical than by the heavy equipment. In addition, the farmer tends to take more interest and care of his ridges. Heavy units are still required to fill-in low or badly eroded areas.

21. *Skeleton Works.* A total of eight buffer dams and 13,024 yards of storm drains was constructed at a total cost of £1,386 5s. 0d. and an average cost of about £6 10s. 0d. per 100 yards of storm drain. A total of 11,480 yards of Watermeadow Guide Banks were also constructed at a cost of £878 10s. 0d. and 16.9 miles of fire guards and fence lines at a cost of £423 10s. 0d.—£25 1s. 3d. per mile.

22. *Bush Clearing.* A total of three hundred and thirty-one acres were cleared for £674 15s. 0d., the cost varying from £1 6s. 5d. to £5 5s. 0d. an acre for heavy thorn clearings.

23. *Sub-soiling.* This was carried out early in the year and although such efficient soil cracking cannot be expected as with late work, results have proved very effective and economic. The D.8 with a three-tine D.7 ripper proved most effective and under bad conditions managed to cover an acre for £2 2s. 7d. A total of 304 acres was accomplished for a cost of £884 10s. 0d. A total of £11,000 was earned by the heavy units in this province during the year.

Choma-Kalomo-Livingstone.

24. A small unit consisting of three Fordson diesel tractors was supplied by the Natural Resources Board complete with necessary machinery and three dams were constructed with the assistance of the Conservation Services. The unit suffered from teething troubles but appeared to work satisfactorily. It was, however, unable to work economically at a charge of 1s. 5d. a cubic yard. Work was held up for lack of spares and heavy expenditure incurred for welding. Total earth moved was 18,475 cubic yards.

25. *Contouring.* An experiment and demonstration area was laid out at Choma comprising eleven miles of contour ridging, two miles of road and a training bank.

26. *General Planning.* The majority of works in this area were in the nature of planning. Staff shortages did not allow otherwise. Maps to show drainage, main topographical features and a provisional soil vegetation classification and distribution were constructed from aerial photographs of the following areas:

Kalomo: Alienated land to the west of the railway.

Choma: Individual catchments for the design of dams constructed by the I.C.A. equipment.

Monze: Alienated land to the south of Ngwesi River and the east of the railway line.

Upper Kaley: Native reserves and European farms.

Mazabuka: Mr. Hurlston's farm.

Ngwesi River, Kalomo District: Nasiankanga Junction to Zambesi Sawmills Railway line.

Preliminary investigational work was done at the beginning of the year in the Livingstone area. This was to be implemented in the dry season, but unfortunately no officer was available.

C.—Eastern Province.

27. A Conservation Officer was posted to the Eastern Province from April to October to give local assistance in conservation works and to investigate the requirements of this area. Light equipment is recommended and it appears advisable for the farmers of this area to apply to the Natural Resources Board for assistance in this form. Due to the poor financial returns from the 1951–1952 season, many farmers are uncertain of their future programmes and this, with lack of capital, has damped their ardour with regard to conservation development.

28. In the course of his investigations the Conservation Officer pegged 1,245 acres of land with 111,000 yards of contour ridging works and 5,100 yards of storm drains. In addition, advice was given with regard to road drainage, dams and gully control work.

Conclusion.

29. Considering the extremely small conservation staff available it can be seen from the above the tremendous amount of ground these few officers are covering. When individuals complain with regard to the lack of personal attention it would be well for them to realise that it is impossible for this staff to keep pace. Great assistance can be given by the individual applying to his I.C.A. Committee and enabling this organisation to produce definite programmes well in advance of requirements.

30. On the older and protected farms more emphasis should be laid on conservation farming, surmounted by a limited well-planned mechanical skeleton conservation layout. In new areas work should be concentrated on planned development. With the present staff it is impossible to carry out regional and farm planning and at the same time give the essential attention to carry on routine field work in advising farmers on the construction and maintenance of their own work.

31. Much more can be done by a co-ordinated and consolidated planned approach on a provincial level, and by the close co-operation of officers within the department with officers of the Departments of Water Development and Irrigation and Veterinary Services, with the I.C.A. Committees and last but not least, with individual farmers.

32. Great work has been done by the few individual farmers who have taken on their shoulders the responsibilities of the intensive conservation areas and their co-operation and cordial association has been greatly appreciated by the staff and the Chief Conservation Officer.

33. An analysis of the work carried out by the mechanical units during 1952 is attached to this Appendix.

J. N. CLOTHIER,
Chief Conservation Officer.

Conservation Section. (See paragraph 33 of the Appendix to this Report.)

ANALYSIS AND SUMMARY OF WORK OF MECHANICAL UNITS, 1952.

Tractor	Hours worked	Revenue earned on hourly basis	Optimum revenue working 1,300 hours	Months in operation	Remarks
		£	£		
D. 6 No. 1	654	1,798	3,575	3	Overhaul and awaiting spares.
6 No. 2	324	891	3,575	3	Overhaul and awaiting spares.
D. 7 No. 1	1,358	4,753	4,550	9	Overhaul and awaiting spares.
7 No. 2	1,278	4,473	4,550	11	Overhaul and awaiting spares.
7 No. 3	508	1,778	4,550	5	Overhaul and awaiting spares.
7 No. 4	441	1,543	4,550	5	Overhaul and awaiting spares.
7 No. 5	802	2,807	2,275	5	Arrived June.
7 No. 6	1,052	3,682	2,650	5	Arrived June.
D. 8 No. 1	1,091	4,367	5,525	9	Overhaul and awaiting spares.
8 No. 2	517	2,197	5,525	5	Overhaul and awaiting spares.
8 No. 3	406	1,725	1,380	3	Arrived September.
D. 4 No. 1	267	534	435	1	Arrived November.
Grader	270	810	1,950	5	Arrived July.
Totals ...	8,968	£31,358	£45,090		

Notes.

1. Total hours worked, 8,968 against approximately 13,000 hours expected on a basis of 1,300 hours per tractor per annum. Losses were due to—

(a) Unusually heavy rains during the first quarter of the year which reduced the total hours worked from a possible 2,600 to 849.

(b) Delay in overhauls awaiting spares.

2. The actual revenue earned was £30,410 and not £31,358 as shown in column three above which is a figure calculated on an hourly rate of working. The difference is a measure of the loss on dam construction charged at 1s. 5d. per cubic yard.

3. The high performance of D.7 tractors Nos. 5 and 6 engaged on regional work in the Upper Kaleya should be noted.

4. It must be recorded that the working costs for the year were £53,924 (including depreciation £13,871) against an actual revenue of £30,410. It should be noted that even if the optimum number of hours had been worked by each tractor, revenue would still have lagged behind costs. Some of the reasons for these losses are—

(a) Charges for work were quite unrealistic by present day standards. Charges are at present £2 15s. 0d. per hour for a D.6, £3 10s. 0d. for a D.7, £4 5s. 0d. for a D.8 and 1s. 5d. per cubic yard in dam construction. Equivalent charges for tractors in Southern Rhodesia are understood to be £4, £5 and £6 respectively, excluding charge for ancillary equipment such as scrapers. Delays in accounting have held up revision, which is now proceeding.

(b) High fixed overhead costs; the present supervisory, servicing and transport facilities were planned for seventeen power units; balance of tractors expected in 1953.

(c) Time and revenue lost in moving heavy equipment to perform relatively small jobs. Work to the average value of £310 was carried out on seventy-three farms, the range in value was from £45 to £1,540. Approximately four hours is lost per tractor unit with each move.

(d) Civil Service Regulations regarding staff incentives and sanctions and the purchase of spares and stores, restrict a Government department by comparison with a private contractor.

5. Policy is being revised in the light of the experience gained during three years' operation of mechanical units and a memorandum will shortly be put up to Government.

